

CLAIMS LISTING

The present state of the claims 1-10 pending herein is as set forth below. The listing of the pending claims supercedes any previous listings. No new matter has been added.

1. (Original) A method for reducing noise in a noisy time-varying input signal y , such as a speech signal; the method including:

receiving the noisy time-varying input signal y ;

deriving from the input signal y a plurality of spectral component signals representing respective magnitudes $|Y(k)|$ of spectral components of the input signal y ;

obtaining a correlation coefficient γ_{sn} indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in the input signal y ($y = s + n$); and

estimating magnitudes of respective noise-suppressed spectral components $\hat{S}(k)$ by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components $|Y(k)|$ of the noisy input signal y , the spectral components $|S(k)|$ of the clean speech signal s , and the spectral components $|N(k)|$ of the noise signal n , where the equation includes the correlation based on the obtained correlation coefficient γ_{sn} .

2. (Original) The method as claimed in claim 1, wherein the correlation coefficient γ_{sn} is predetermined.

3. (Original) The method as claimed in claim 1, wherein the step of obtaining the correlation coefficient γ_{sn} includes estimating the correlation coefficient γ_{sn} .

4. (Original) The method as claimed in claim 3, wherein the step of estimating the correlation coefficient γ_{sn} includes determining a minimum negative spectrum ratio.

5. (Original) The method as claimed in claim 4, wherein the negative spectrum ratio NSR represents a proportion of spectral components $\hat{S}(k)$ which would be negative based on the solution of the correlation equation.

6. (Original) The method as claimed in claim 5, wherein the method includes:

initializing the correlation coefficient γ_{sn} with a non-zero value; and
iteratively:

performing the step of solving the correlation equation to obtain $|\hat{S}(k)|$; and

estimating a new correlation coefficient based on a gradient decent of the
negative spectrum ratio NSR for $\hat{S}(k)$.

7. (Original) The method as claimed in claim 1, wherein the step of solving the correlation equation includes iteratively estimating the noise-suppressed spectrum $\hat{S}(k)$.

8. (Original) The method as claimed in claim 7, wherein method includes calculating an initial estimate of a magnitude of the noise-suppressed spectrum $\hat{S}^{(0)}(k)$ by subtracting a magnitude of an estimate of the respective spectral components $\hat{N}(k)$ of the noise signal n from a magnitude of the respective spectral components $Y(k)$ of the noisy input signal y .

9. (Original) The method as claimed in claim 7, wherein the step of performing the iterative spectrum estimation includes in each iteration:

estimating a magnitude of an auxiliary noise-suppressed spectrum based on the correlation equation where a term with the correlation coefficient γ_{sn} is based on a current estimate of a magnitude of the noise-suppressed spectrum $\hat{S}^{(l)}(k)$; and

estimating a new magnitude of the noise-suppressed spectrum $\hat{S}^{(l+1)}(k)$ based the estimated magnitude of the auxiliary noise-suppressed spectrum and on the current estimate of a magnitude of the noise-suppressed spectrum $\hat{S}^{(l)}(k)$.

10. (Original) An apparatus for reducing noise in a noisy time-varying input signal y , such as a speech signal; the apparatus including:

an input for receiving the noisy time-varying input signal y ;

means for deriving from the input signal y a plurality of spectral component signals representing respective magnitudes $|Y(k)|$ of spectral components of the input signal y ;

means for obtaining a correlation coefficient γ_{sn} indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in the input signal y ($y = s + n$); and

means for estimating magnitudes of respective noise-suppressed spectral components $\hat{S}(k)$ by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components $|Y(k)|$ of the noisy input signal y , the spectral components $|S(k)|$ of the clean speech signal s , and the spectral components $|N(k)|$ of the noise signal n , where the equation includes the correlation based on the obtained correlation coefficient γ_{sn} .